



TEST REPORT

Report Number: R14204340-E4

Applicant : Stryker Instruments
1941 Stryker Way
Portage, MI 49002, USA

Model : System 9

FCC ID : Q9R-9110120550

EUT Description : Sterile Battery Charger

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C

Date Of Issue:

2022-08-16

Prepared by:

UL LLC

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REVISION HISTORY

Ver.	Issue Date	Revisions	Revised By
1	2022-06-02	Initial Issue	Brian Kiewra
2	2022-08-16	Revised table in Section 2 and header for Section 8 to state emissions bandwidth.	Brian Kiewra

TABLE OF CONTENTS

REVISION HISTORY	2
TABLE OF CONTENTS	3
1. ATTESTATION OF TEST RESULTS	4
2. TEST RESULTS SUMMARY	5
3. TEST METHODOLOGY	5
4. FACILITIES AND ACCREDITATION	5
5. DECISIONS RULES AND MEASUREMENT UNCERTAINTY	6
5.1. METROLOGICAL TRACEABILITY	6
5.2. DECISION RULES.....	6
5.3. SAMPLE CALCULATION	6
5.4. MEASUREMENT UNCERTAINTY.....	6
6. EQUIPMENT UNDER TEST	7
6.1. DESCRIPTION OF EUT	7
6.2. MAXIMUM PEAK RADIATED E-FIELD.....	7
6.3. WORST-CASE CONFIGURATION AND MODE.....	7
6.4. DESCRIPTION OF TEST SETUP.....	8
7. TEST AND MEASUREMENT EQUIPMENT	9
8. OCCUPIED BANDWIDTH	11
9. RADIATED EMISSION TEST RESULTS.....	13
9.1. LIMITS AND PROCEDURE.....	13
9.2. TX FUND AND SPURIOUS EMISSIONS FROM 9 kHz TO 30 MHz	14
9.3. TX SPURIOUS EMISSIONS 30 TO 1000 MHz.....	15
10. AC MAINS LINE CONDUCTED EMISSIONS	17
11. SETUP PHOTOS	20
END OF TEST REPORT	20

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Stryker Instruments
1941 Stryker Way
Portage, MI 49002, USA

EUT DESCRIPTION: Sterile Battery Charger

MODEL: System 9

SERIAL NUMBER: AB2212200669, AB2212200639

SAMPLE RECEIVE DATE: 2022-05-16

DATE TESTED: 2022-05-16 to 2022-05-25

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Refer to Section 2

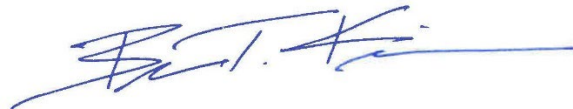
UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document.

Approved & Released
For UL LLC By:

Prepared By:



Michael Antola
Staff Engineer
UL LLC – Consumer Technology Division

Brian Kiewra
Project Engineer
UL LLC – Consumer Technology Division

2. TEST RESULTS SUMMARY

FCC Clause	Requirement	Result	Comment
For reporting purpose only	Emission Bandwidth	See comment	This is to demonstrate that the emission bandwidths do not encroach into restricted bands.
15.209, 15.205	Radiated Emissions	Compliant	None.
15.207	AC Mains Conducted Emissions	Compliant	None.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC / OST MP-5, "FCC Methods of Measurements of Radio Noise Emissions from Industrial, Scientific, and Medical Equipment".

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification # 0751.06, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
<input checked="" type="checkbox"/>	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A		27265	

5. DECISIONS RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement).

5.3. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$
$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Final Voltage (dBuV)} = \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \text{LISN Insertion Loss.}$$
$$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$$

5.4. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%
Time	3.39%

Uncertainty figures are valid to a confidence level of 95%.

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is a sterile battery charge with NFC and WPT. This test report covers WPT testing.

6.2. MAXIMUM PEAK RADIATED E-FIELD

The transmitter has maximum peak radiated magnetic strength as follows:

Fundamental Frequency (KHz)	Mode	E-field (300m distance) (dBuV/m)
125.5-133.9	Charging 6 Batteries	7.8

6.3. WORST-CASE CONFIGURATION AND MODE

The EUT is a sterile battery charger with wireless inductive charging. The EUT while charging six batteries is considered worst case. The following modes were investigated:

- Small batteries, all 6 batteries in three 2 slot containers
- Small batteries, all 6 batteries with each individual battery in a bay
- Large batteries, all 6 batteries in three 2 slot containers
- Large batteries, all 6 batteries with each individual battery in a bay

All batteries were investigated offset and centered in individual bays and in containers.

Worst case was found to be large batteries, all 6 batteries with each individual battery in bay, with the batteries offset in corner of each bay. All testing performed in this configuration.

Also, EUT is intended to operate in one orientation. Therefore all testing performed with the EUT in the intended orientation of operation.

6.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Wi-Fi /Router	NETGEAR	AC1750	59BF127WA35B6	PY316200342
Fiberoptic Ethernet Transceivers	Pontus for Ethernet	N/A	4682203210	N/A
Laptop	HP	14-DK1xxx	5CG016B4XM	N/A
Laptop	HP	11-ah112dx	5CD8294MZY	N/A
Router	Netgear	R6400v2	59BE0B74A5D4D	PY316200342

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	1	1	Hardwired	Mains	1m	Connects to AC mains
2	2	2	Ethernet	Cat6A	1m	Connect to laptop for test configuration.
3	3	2	Ethernet	Cat6A	1m	Connect to router

SETUP DIAGRAM

Refer to exhibit R14204340-EP3 for setup diagram.

7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Line-Conducted Emissions – Voltage (RTP-CDE)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
85496	EMI Test Receiver 9kHz-3.6GHz	Rohde & Schwarz	ESR3	2021-08-17	2022-08-17
CBL004	Coaxial cable, 20 ft., BNC -male to BNC-male	UL	RG-223	2021-08-02	2022-08-02
HI0093	Temp/Humid/Pressure Meter	Extech	SD700	2021-08-11	2022-08-11
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
206212	Transient Limiter, 0.009 to 100 MHz	Electro-Metrics	EM 7600	2021-08-02	2022-08-02
LISN001	LISN, 50-ohm/50-uH, 250uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2021-08-16	2022-08-16

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
SA0026	Spectrum Analyzer	Keysight Technologies	N9030A	2021-07-26	2022-07-26
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2021-07-12	2022-07-12
SOFTEMI	Antenna Port Software	UL	Version 2022.5.4	NA	NA
MM0167	True RMS Multimeter	Keysight Technologies	U1232A	2021-08-17	2023-08-17
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
MM0165	Multimeter	Agilent	U1232A	2021-08-18	2022-08-18

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

Equipment ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2021-08-19	2022-08-19
30-1000 MHz					
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2021-08-30	2022-08-30
Gain-Loss Chains					
C2-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2021-07-09	2022-07-09
C2-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2021-07-09	2022-07-09
Receiver & Software					
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2022-03-08	2023-03-08
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
PS216	AC Power Source	Elgar	CW2501M (s/n 1045A04231)	NA	NA
H10093	Temp/Humid/Pressure Meter	Extech	SD700	2021-08-11	2022-08-11

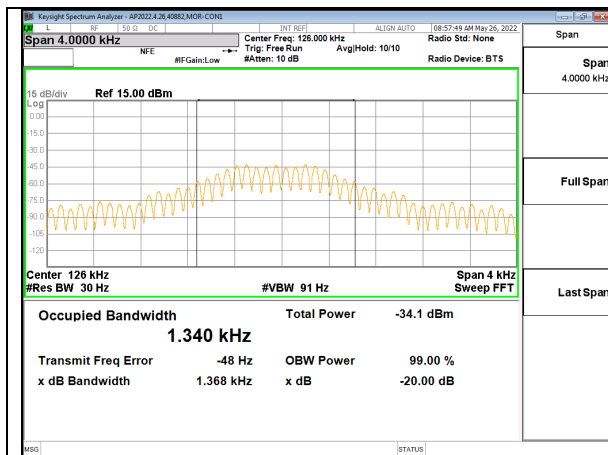
8. EMISSIONS BANDWIDTH

TEST PROCEDURE

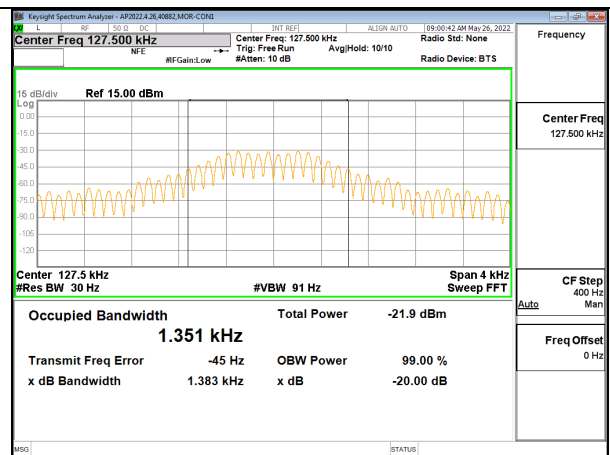
The transmitter output is measured by a near field probe. The RBW shall be in the range of 1% to 5% of the actual emissions bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

20dB BW

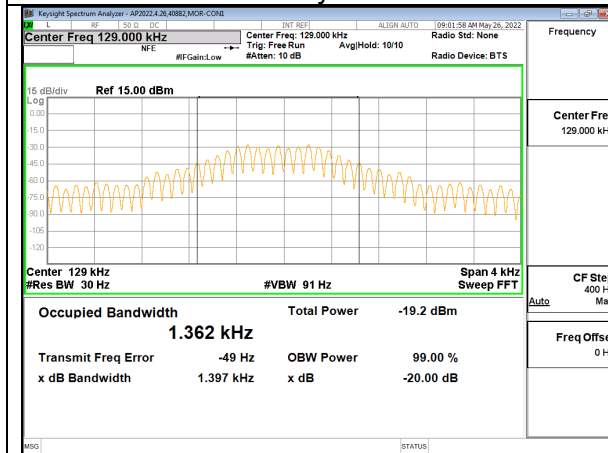
Bay	Frequency (kHz)	20dB Bandwidth (KHz)
1	126	1.368
2	127.5	1.383
3	129	1.397
4	130.5	1.413
5	132	1.429
6	133.5	1.442



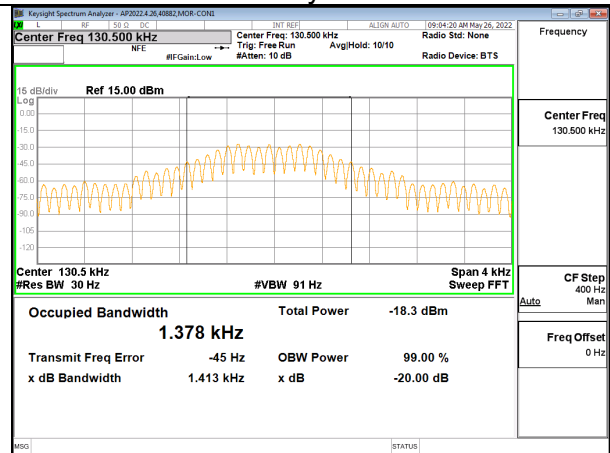
Bay 1



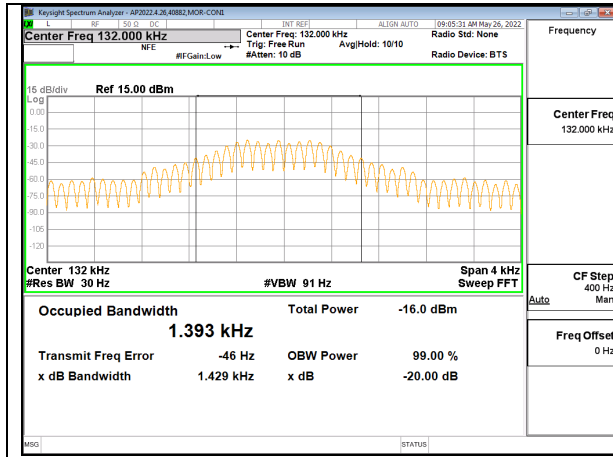
Bay 2



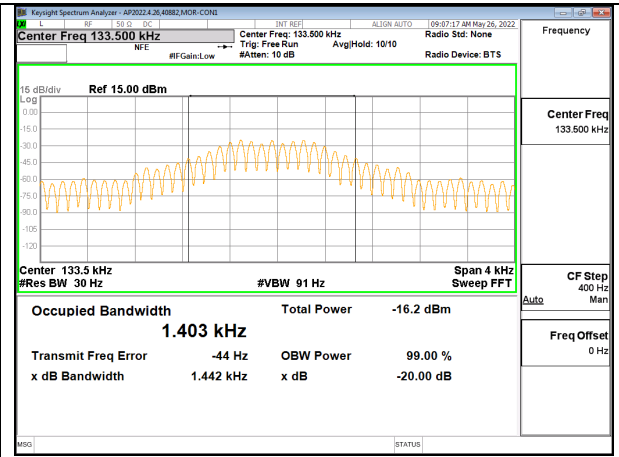
Bay 3



Bay 4



Bay 5



Bay 6

9. RADIATED EMISSION TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.209 (a)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100	3
88 to 216	150	3
216 to 960	200	3
Above 960 MHz	500	3

Note: The lower limit shall apply at the transition frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

Resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9-150kHz range. Peak detection is used unless otherwise noted as quasi-peak.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

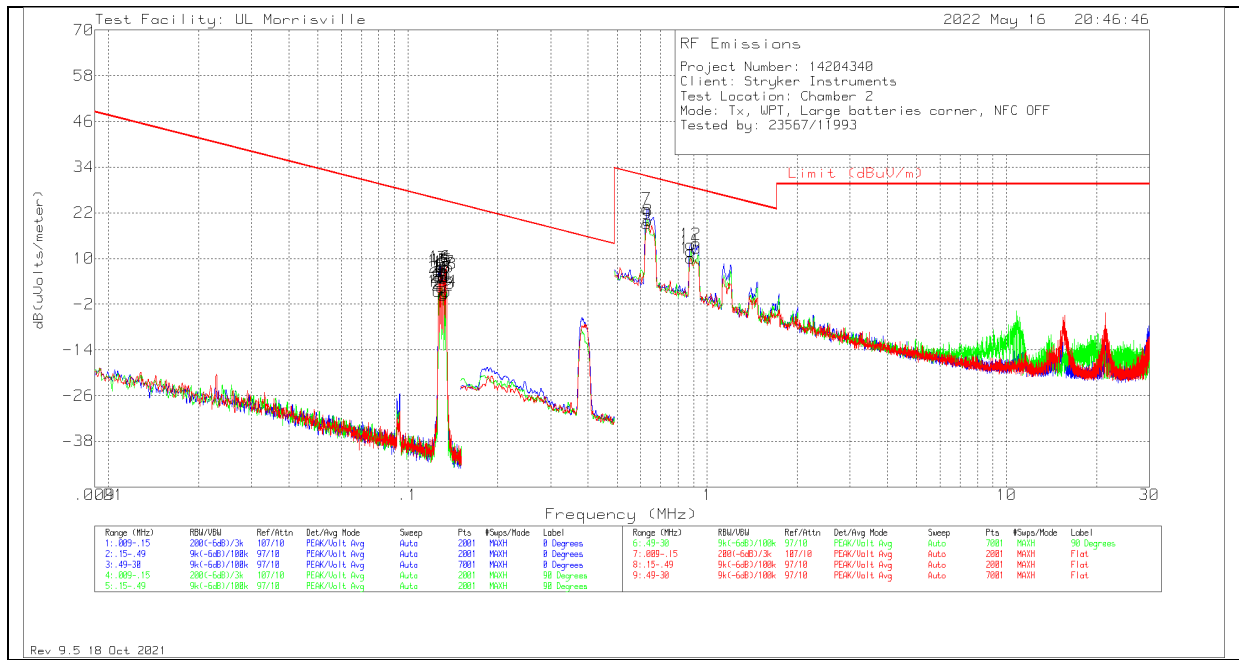
Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

KDB 414788 Open Field Site (OFS) and Chamber Correlation Justification

OFS and chamber correlation testing had been performed and chamber measured test result is the worst-case test result.

9.2. TX FUND AND SPURIOUS EMISSIONS FROM 9 kHz TO 30 MHz

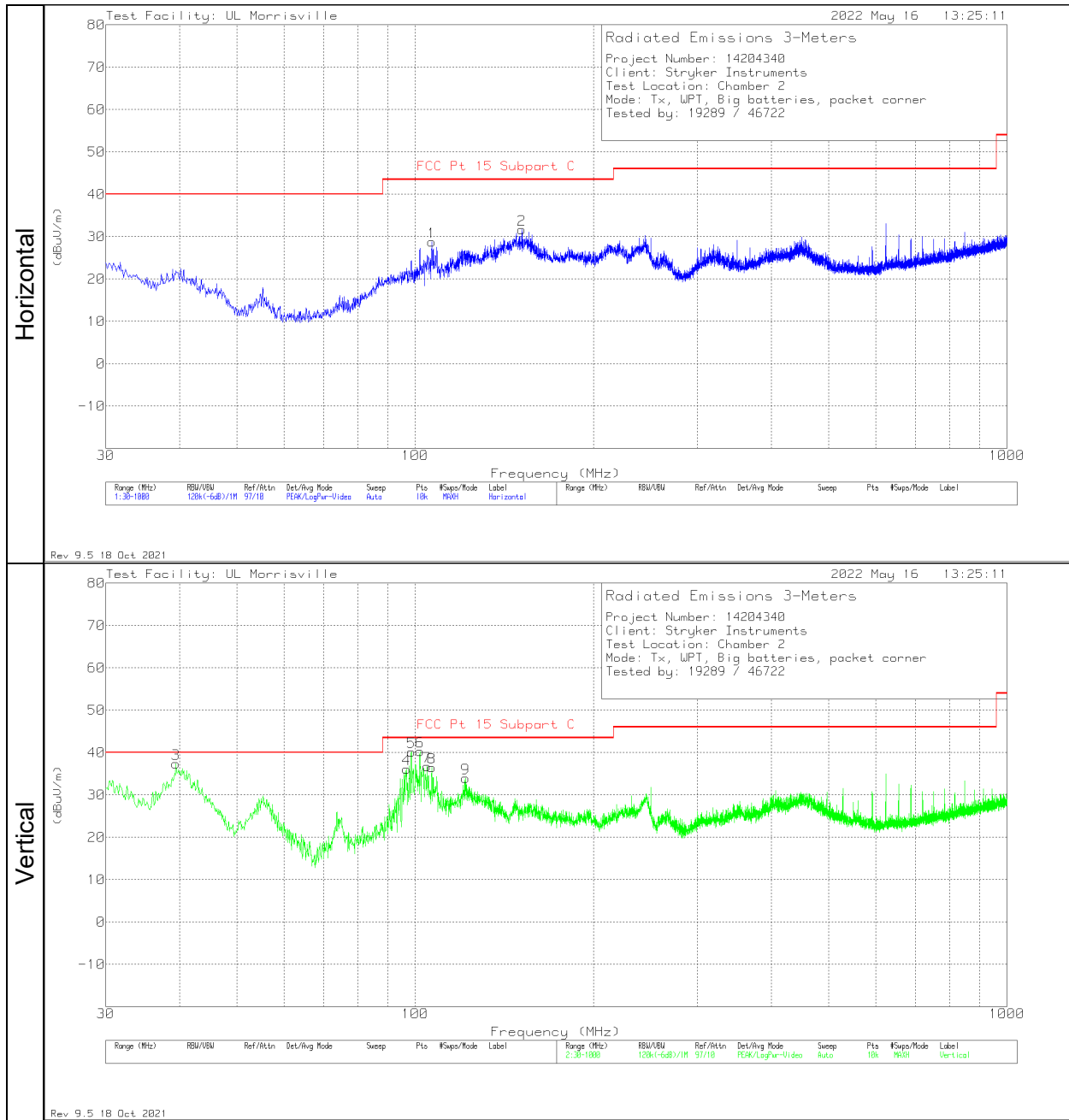
Note for below 30 MHz scans: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log (test distance / specification distance).



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0059 (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	QP/AV Limit (dBuV/m)	PK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
13(Bay 1)	.12651	76.3	Pk	10.3	.1	-80	6.7	25.56	45.56	-18.86	0-360	100	0 degs
19(Bay 1)	.12651	70.99	Pk	10.3	.1	-80	1.39	25.56	45.56	-24.17	0-360	100	90 degs
1(Bay 1)	.12651	75.09	Pk	10.3	.1	-80	5.49	25.56	45.56	-20.07	0-360	100	Flat
20(Bay 2)	.12807	74.5	Pk	10.3	.1	-80	4.9	25.46	45.46	-20.56	0-360	100	90 degs
14(Bay 2)	.12821	77.37	Pk	10.3	.1	-80	7.77	25.45	45.45	-17.68	0-360	100	0 degs
2(Bay 2)	.12835	74.96	Pk	10.3	.1	-80	5.36	25.44	45.44	-20.08	0-360	100	Flat
15(Bay 3)	.12949	76.54	Pk	10.3	.1	-80	6.94	25.36	45.36	-18.42	0-360	100	0 degs
21(Bay 3)	.13006	71.89	Pk	10.3	.1	-80	2.29	25.32	45.32	-23.03	0-360	100	90 degs
3(Bay 3)	.13006	77.19	Pk	10.3	.1	-80	7.59	25.32	45.32	-17.73	0-360	100	Flat
16(Bay 4)	.13105	74.76	Pk	10.3	.1	-80	5.16	25.26	45.26	-20.1	0-360	100	0 degs
22(Bay 4)	.13105	70	Pk	10.3	.1	-80	.4	25.26	45.26	-24.86	0-360	100	90 degs
4(Bay 4)	.13105	74.44	Pk	10.3	.1	-80	4.84	25.26	45.26	-20.42	0-360	100	Flat
5(Bay 5)	.13254	76.62	Pk	10.3	.1	-80	7.02	25.16	45.16	-18.14	0-360	100	Flat
17(Bay 5)	.13261	76.09	Pk	10.3	.1	-80	6.49	25.15	45.15	-18.66	0-360	100	0 degs
23(Bay 5)	.13261	70.51	Pk	10.3	.1	-80	.91	25.15	45.15	-24.24	0-360	100	90 degs
18(Bay 6)	.1341	75.59	Pk	10.3	.1	-80	5.99	25.06	45.06	-19.07	0-360	100	0 degs
24(Bay 6)	.1341	70.98	Pk	10.3	.1	-80	1.38	25.06	45.06	-23.68	0-360	100	90 degs
6(Bay 6)	.1346	77.4	Pk	10.3	.1	-80	7.8	25.02	45.02	-17.22	0-360	100	Flat
7	.62913	52.62	Pk	10.2	.2	-40	23.02	31.63	-	-8.61	0-360	100	0 degs
9	.62913	48.72	Pk	10.2	.2	-40	19.12	31.63	-	-12.51	0-360	100	Flat
8	.63334	49.56	Pk	10.2	.2	-40	19.96	31.57	-	-11.61	0-360	100	90 degs
12	.88209	43.29	Pk	10.2	.2	-40	13.69	28.69	-	-15	0-360	100	0 degs
11	.88209	41.44	Pk	10.2	.2	-40	11.84	28.69	-	-16.85	0-360	100	90 degs
10	.88209	39.63	Pk	10.2	.2	-40	10.03	28.69	-	-18.66	0-360	100	Flat

Pk - Peak detector

9.3. TX SPURIOUS EMISSIONS 30 TO 1000 MHz



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	FCC Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
9	* **121.665	44.11	Pk	20	-30.2	33.91	43.5	-9.59	0-360	101	V
3	40.3531	45.24	Qp	19.5	-31.2	33.54	40	-6.46	210	108	V
4	96.639	51.41	Pk	15.4	-30.7	36.11	43.5	-7.39	0-360	101	V
5	98.4271	52.92	Qp	15.9	-30.4	38.42	43.5	-5.08	360	109	V
6	101.87892	52.14	Qp	17	-30.4	38.74	43.5	-4.76	360	110	V
7	104.69	49.59	Pk	17.7	-30.5	36.79	43.5	-6.71	0-360	101	V
8	106.63	48.55	Pk	18.2	-30.3	36.45	43.5	-7.05	0-360	101	V
1	106.727	40.86	Pk	18.2	-30.3	28.76	43.5	-14.74	0-360	299	H
2	151.541	43.05	Pk	18.5	-29.9	31.65	43.5	-11.85	0-360	199	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

Qp – Quasi-Peak detector

10. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207 (a)

Frequency of emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

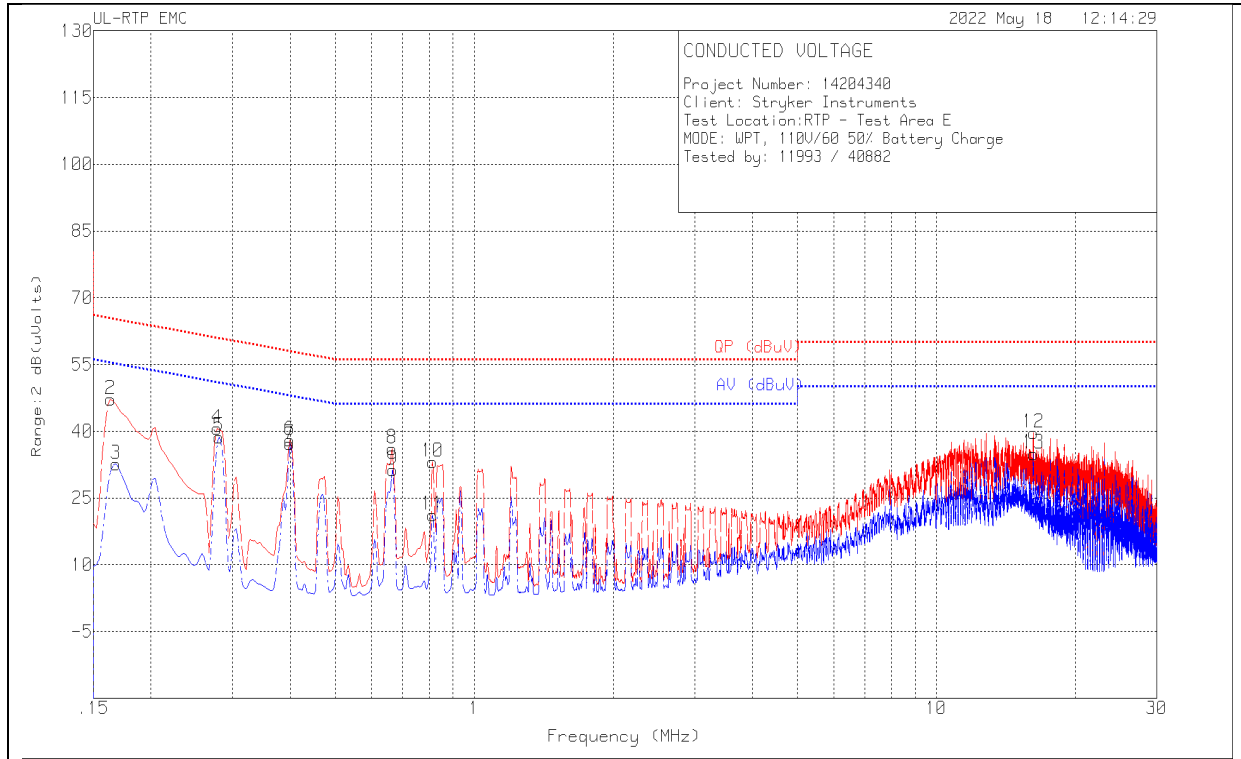
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz above 150kHz and 200Hz below 150kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both lines.

RESULTS

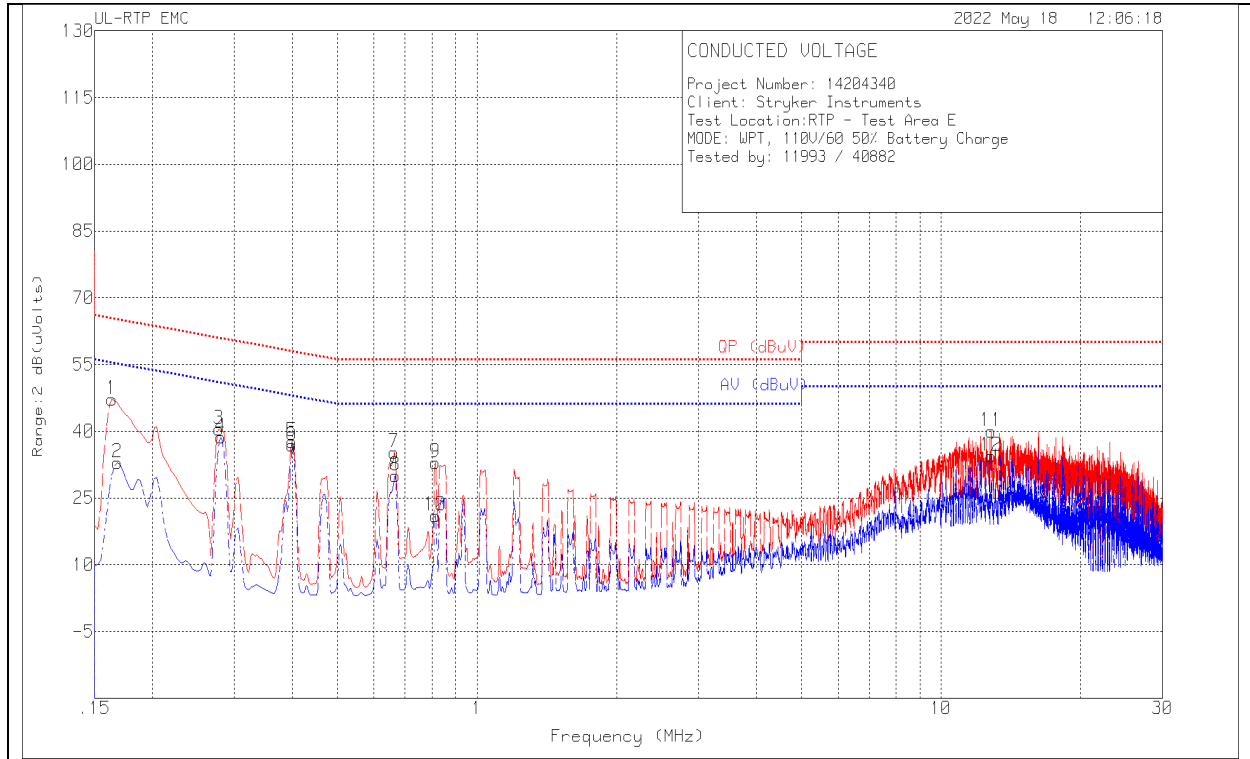
LINE 1 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN001 (dB)	CBL004_206212 (dB)	Corrected Reading dB(uVolts)	QP (dBuV)	Margin (dB)	AV (dBuV)	Margin (dB)
3	.168	22.66	Ca	.1	9.8	32.56	-	-	55.06	-22.5
5	.2805	28.86	Ca	.1	9.8	38.76	-	-	50.8	-12.04
7	.39975	27.26	Ca	.1	9.8	37.16	-	-	47.86	-10.7
9	.6675	21.39	Ca	.1	9.8	31.29	-	-	46	-14.71
11	.81375	11.22	Ca	.1	9.8	21.12	-	-	46	-24.88
13	16.2285	24.8	Ca	.1	10.1	35	-	-	50	-15
2	.1635	37.24	Qp	.1	9.8	47.14	65.28	-18.14	-	-
4	.27825	30.77	Qp	.1	9.8	40.67	60.87	-20.2	-	-
6	.39975	28.07	Qp	.1	9.8	37.97	57.86	-19.89	-	-
8	.66525	26.24	Qp	.1	9.8	36.14	56	-19.86	-	-
10	.81375	23.19	Qp	.1	9.8	33.09	56	-22.91	-	-
12	16.2285	29.5	Qp	.1	10.1	39.7	60	-20.3	-	-

Qp - Quasi-Peak Detector
 Ca - CISPR Average Detection

LINE 2 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN001 (dB)	CBL004_206212 (dB)	Corrected Reading dB(uVolts)	QP (dBuV)	Margin (dB)	AV (dBuV)	Margin (dB)
2	.168	23.09	Ca	.1	9.8	32.99	-	-	55.06	-22.07
4	.2805	28.74	Ca	.1	9.8	38.64	-	-	50.8	-12.16
6	.39975	26.91	Ca	.1	9.8	36.81	-	-	47.86	-11.05
8	.6675	20.07	Ca	.1	9.8	29.97	-	-	46	-16.03
10	.81375	11.2	Ca	.1	9.8	21.1	-	-	46	-24.9
12	12.8085	24.21	Ca	.1	10.1	34.41	-	-	50	-15.59
1	.1635	37.29	Qp	.1	9.8	47.19	65.28	-18.09	-	-
3	.27825	30.58	Qp	.1	9.8	40.48	60.87	-20.39	-	-
5	.39975	27.84	Qp	.1	9.8	37.74	57.86	-20.12	-	-
7	.663	25.28	Qp	.1	9.8	35.18	56	-20.82	-	-
9	.81375	23.12	Qp	.1	9.8	33.02	56	-22.98	-	-
11	12.8085	29.78	Qp	.1	10.1	39.98	60	-20.02	-	-

Qp - Quasi-Peak Detector
 Ca - CISPR Average Detection

11. SETUP PHOTOS

Refer to exhibit R14204340-EP3 for setup photos.

END OF TEST REPORT